



# Essentials of PLANT NURSERY MANAGEMENT

P.K. Ray



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Second Edition



ESSENTIALS OF

# Plant Nursery Management

**Second Edition**

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# ESSENTIALS OF PLANT NURSERY MANAGEMENT

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A society grows great when old men plant trees  
whose shade they know they shall never sit in.

— *A Greek proverb*



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# Preface

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The book on Plant Nursery Management was first published in February 2012 with purpose of providing an opportunity to the readers/learners to acquire fairly good knowledge of the fundamentals of plant multiplication and initial plant care in the nursery. The text was oriented to develop the ability to apply these fundamentals in solving practical problems in managing a plant nursery so that the nursery workforce including the owner can acquire proficiency in any related operation and realise maximum benefit from their efforts.

The second edition of the book “Essentials of Plant Nursery Management” represents a thoroughly revised and updated version of the preceding edition. Following recommendations and suggestions from users and reviewers, much care has gone into rectifying inadequacies of some sections of this book. The main aim of the book, however, remains the same i.e. to examine the scientific concepts and understand the biological rationale behind practices adopted in production/ multiplication of plants and their maintenance till their final establishment at a permanent site. Without the basic knowledge, good results are less easily achieved, less easily interpreted and the path ahead for future progress in plant multiplication is less clear.

Today plant nursery business has grown to a massive, world-wide, multi-billion-dollar industry. Developments in technology, increasing sophistication in production practices and marketing of nursery stock and globalized trade regulations have all made an impact on this business. The demand for quality nursery plants is increasing day by day. To meet an increasingly high demand for the planting materials suited to different environmental and growth conditions, the nursery industry is going to face big challenges in the near future. Scaling up production at a reasonable cost requires follow-up of highly precise, technically sound, practical and result oriented management practices. The second edition of this book provides succinct and authoritative knowledge relating to the production of a wide range of nursery plants and reflects on significant recent advances in the areas of plant propagation, hardening and proper upkeep of the nursery plants, management of pests and pathogens and other related aspects. Wherever required the latest concepts have been incorporated in the chapters and organization of the book is improved. A completely new chapter has been added on “Mechanisation and Automation in the Plant Nursery” keeping in mind the technological advances in the area.

Courses on plant propagation and nursery management are offered at various levels of undergraduate and graduate studies in various departments e.g. Botany, Plant Science, Horticulture, Agriculture, Forestry and Bioscience. The

choice of topics dealt with has been deliberate to ensure a comprehensive treatment of all aspects of plant nursery management. The book is indispensable for students and practicing nursery men. The comprehensive coverage of all-important topics makes it unique as no other book has all the information at one place covering the entire gamut of nursery management practices.

It has been gratifying to see the first edition of this book become a standard text and reference in the subject. The feedback received from users of the book prompted to go for its second revised edition. I hope that going through this updated version will continue to be a more satisfying experience and researchers, students, and professionals will find the book extremely useful.

Much care has gone into the production of this volume. The author is grateful to his colleagues at DRPCA, Pusa for their help and support in writing the book. However, in spite of all care some inadequacies may remain in any endeavor. In the present case, some inadvertent errors are my own doings and some might be due to lack of information on certain points. Nevertheless, the final content of the book remains entirely my own responsibility. At Scientific Publishers (India), Jodhpur special thanks are due to Mr. Tanay Sharma for his enthusiastic support of the Second Edition. I have enjoyed his association for many years and wish to express my appreciation for his goodwill. I also acknowledge with deep fondness the support of Mrs. Urmila Ray, my wife, for her moral encouragement and forbearance during the preparation of this edition.

**P.K. Ray**

Patna,  
2 April, 2020

# Preface (First Edition)

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The book is a simple and practical guide to nursery management and focuses light on all elements of nursery management e.g. type of nursery, developing a sound business plan for its successful operation, selection of site, , nursery layout and design, choosing plant species and establishment, propagation methods, rooting and growing media, transplanting, fertilization, irrigation and drainage, and plant protection measures. Other allied aspects of nursery managements e.g. work scheduling and staffing, equipment and structures, greenhouse production, breeding new types and ownership rights, production risks, nursery stock as well as human resource management, pricing policy and marketing strategies, nursery laws, and revival of a sick nursery have also been discussed in great detail. It covers almost all subjects of the compulsory course on *Plant Propagation and Nursery Management* for graduating students in Agriculture/ Horticulture/Forestry colleges. The main objective is to provide concise but complete information on "*How to Start and Operate a Plant Nursery*".

The book outlines a simple, practical approach to achieving success in nursery business. A considerable portion of each chapter is written like a counseling session. This approach is aimed at providing as much opportunity for self-help as possible. It is expected that the book would be quite helpful in improving business performance, competitiveness and profitability of a person who owns the nursery. The publication is thus not only an essential reading for graduating students but for anyone considering entry into the nursery industry, and also for those who are already in the business.

Besides students and nursery professionals, a wide range of people, including horticulturists, gardeners, florists, foresters, arborists, and extension workers who desire a good understanding of the subject would find this book a very useful publication. This book offers readers not just a theoretical account of the subject but also practical measures to overcome difficulties in achieving tangible results in the field. However, it is not meant as a primer for inexperienced growers, but rather as a complementary piece of information that concentrates on sustainable production of nursery plants to earn substantive profit. Also, it is not within the limit of a book of this length to give a comprehensive detail of all botanical terms. Nevertheless, effort has been made to explain such terms wherever felt necessary.

This publication contains information collected from several publications on the subject and the related topics. I am greatly indebted to all those authors/publishers whose work was consulted and incorporated in the text. Some of the

information contained in the many invaluable advisory bulletins and leaflets of the Agriculture Department of different countries has been used directly or indirectly during preparation of the text. I gratefully acknowledge all sources from where the information was collected.

I also express appreciation to all colleagues and co-workers who have assisted me in any way in preparation of the manuscript of this publication. In particular, I am thankful to all my colleagues in the Horticulture Department for inspiration and making valuable suggestions for improvement in the text. In particular, I extend sincere thanks to Dr. S.K. Singh, Dr. U. Mukherjee, and Mr. S. Kumar for much general help in getting the manuscript published. All three have been for many years my close collaborators in research on tropical fruits. Not least, I also offer my sincere thanks to Mr. Govind Kumar for his excellent assistance in typesetting and incorporating editorial changes in the final text.

Since this is a first edition, it may contain some errors that crept in inadvertently in spite of all editorial care. I am always interested to hear comments and suggestions from readers for improvement. You can contact me by e-mail, for which address is [pkraypusa@gmail.com](mailto:pkraypusa@gmail.com).

**P.K. RAY**

Pusa,  
7 October, 2011



## *Chapter - 1*

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# INTRODUCTION

By definition, a plant nursery is an enclosed or fenced area designated for the short term growing of plant materials in anticipation of moving them to other sites or locations at their appropriate maturity. The plants which are usually grown in the nursery may be seedlings (sexually propagated) or asexually propagated planting materials of fruits, vegetables, flowers, ornamentals, avenue and forest trees, ground covers (grasses), vines, spices, medicinal or aromatic plants or any special plant species required for small- or large-scale planting at a new location. *Therefore, in a strictly professional way the nursery is a place where plants are propagated and grown to usable size for sale to others. Here mass multiplication of quality planting material and their upkeep up to a certain stage of growth is the central theme.* However, many individuals grow seedlings of vegetables/ or flowers in the nursery for their own use. But by and large, it is a trade oriented dynamic process which refers to efficient utilization of resources for raising new plants / propagules for earning economic returns.

Like any other business, a plant nursery has several customers. It sells plants to gardeners, homeowners or any person/ organization/group interested in taking up a new plantation. While different nurseries have different niches, most plant nurseries carry a wide variety of seeds, seedlings, asexually raised planting materials of annual and perennial plants, fruit saplings, annual plants, house-plants, potting soil, moss, growing media, fertilizers, rooting hormones, and gardening accessories, such as knives and pruning tools, containers, pots, gardening magazines / books/ equipment, and decorative items.

The successful nursery operator must be knowledgeable about all phases of plant production and be willing to work hard for long hours. Good marketing and management skills are essential. A passion for variety of plants and an entrepreneurial spirit add greatly to the chances for success. A successful plant nursery business must be well conceived from the very beginning, with a business plan that details things like specific niche, marketing plan, potential customers, capital outlay and production schedule. Without planning and the right skills, a plant nursery business will have difficulty in succeeding.

A prospective nursery man who already owns property will thus need to evaluate first whether the land is suitable for the nursery business and then select crops that are appropriate for that growing site. An alternative approach is to decide on the crops first and then purchase a site where those crops will grow well. Regardless of which approach is used, it is vital to the success of the nursery to match the crops with the land. The book throws light on what would be the right course of action in a particular situation. Starting or running a plant nursery business is just like running any other business and depending upon size of operation, it requires a large capital investment for development of infrastructure and instrumentation. Further, it falls in the category of a high-risk venture and is prone to suffer badly from vagaries of climate.

While plant nursery owners must possess general business skills, formal horticultural training is imperative to success of their business. Anyone who owns a plant nursery business must know the ins and outs of all kinds of plant life. It is important to know that how will you acquire this knowledge? The first option is to get a formal education in the field, either from a two-year certificate or diploma program or a four-year bachelor degree program in Horticulture. However, if any person is switching from another career to plant nurseries and doesn't have the desire or time to go through a degree program then there are several other ways to gain experience.



**Fig. 1.1:** A green-house nursery growing a variety of flowering plants

A nursery business is based primarily on strong plant production and selling skills. Elements of success include running a market driven operation and using sound business practices. These skills can be acquired by a combination of reading, talking to industry suppliers, extension people, and other nursery